Code No: R22033 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations, April/May-2017
THERMAL ENGINEERING - I
(Com. to ME, AME)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Briefly explain the following: (i) time loss factor, (ii) heat loss factor, (iii) exhaust blowdown factor. (8M)
   b) Define volumetric efficiency and discuss the effect of various factors affecting the volumetric efficiency. (7M)

2. a) Explain the principle of working of Wankle engine. (8M)
   b) With a neat sketch explain the working principle of a simple carburetor. (7M)

3. a) Explain the effect of engine variables on flame speed. (8M)
   b) Briefly explain the stages of combustion in SI engines elaborating the flame front propagation. (7M)

4. a) What are homogeneous and heterogeneous mixtures? In which engines these mixtures are used? Explain. (8M)
   b) Explain the phenomenon of knock in CI engines and compare it with SI engine knock. (7M)

5. a) Explain the use of Prony brake and rope brake in measuring the power output of an engine. (8M)
   b) Classify the meters used for measuring air flow and explain. (7M)

6. a) In a two stage air compressor, in which intercooling is perfect, prove that the work done in compression is a minimum when the pressure in the intercooler is the geometric mean between the initial and final pressures. Draw the indicator diagram for two stage compression. (8M)
   b) Determine the cylinder dimensions of a double acting, 11 kW indicated power, air compressor which compresses air from 1 bar to 7 bar according to the law $pv^{1.2}$= constant. The average piston speed is 150 m/s. Assume stroke to diameter ratio of 1.5 and neglect clearance. (7M)

7. a) Give the mechanical details and explain the principle of working of Roots blower (7M)
   b) A centrifugal compressor having compression ratio of 2 delivers air at the rate of 1.5 kg/s. Find the power required to drive the compressor with isothermal compression, if the intake temperature is 300 K. (8M)

8. a) With a suitable sketch explain the working principle of an axial flow compressor? (6M)
   b) An axial flow compressor stage has blade root, mean and tip velocities of 150,200 and 250 m/s. The stage is to be designed for a stagnation temperature rise of 20K and an axial velocity of 150m/s, both constant from root to tip. The work done factor is 0.93. assuming 50% reaction at mean radius calculate the stage air angles at root, mean and tip and the degree of reaction at root and tip for a free vortex design. (9M)
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